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The value of θ could be determined from an X-ray photograph of a mercury meniscus in a capillary composed of the material under examination, or by the drop-shape method.

AN APPARENT CASE OF NON-MENDELIAN INHERITANCE IN *DATURA* DUE TO A DISEASE

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In the common Jimson Weed (*Datura Stramonium*), spiny or armed capsules are dominant to smooth or *inermis* capsules. A cross between two plants, each homozygous for a single member of this pair of characters will produce spiny fruited offspring in the F_1 and a ratio of 3 spiny to 1 smooth plant in the F_2 generation.

In 1915, the writer found a single *inermis* plant in a culture where smooth capsules could not have occurred through segregation. It was considered a new *inermis* mutation and its inheritance was therefore studied in crosses with normals.

The new form was called Quercina on account of the increased oak-like dentation of its leaves. The most conspicuous character on the mature plant was the partial or complete suppression of spines on the capsules. An examination of the plants throughout the growing and flowering condition indicated that other parts of the plant were also involved and showed such changes as the slitting of the normally undivided corolla, the absence of pollen, which caused the plant to depend upon outcrossing in order to set seed, and certain other characters associated with less vigorous growth.

Later investigation showed that the Quercina character occurred spontaneously in the garden cultures in many ways like a vegetative mutation. In a single year's test, about $1\frac{1}{4}$ per cent of the normal plants in the field took on the Quercina character by the last of the season. This Quercina character generally shows itself weakly in a single branch and gradually spreads to all the new growth. It occasionally happens on plants which are acquiring the Quercina character that capsules will be found in a transitional condition with their spines only partially reduced. Sometimes some of the valves may be entirely smooth and others on the same capsule fully spined.

So far as we can judge from the literature, other investigators who have worked on the Jimson Weed found have Quercina plants in their cultures. They seem not to have noticed, however, any of the distinctive characters other than those shown by the capsules.

Naudin¹ reports in an F_1 between an *inermis* variety (*D. laevis*) of *D. Stramonium* and the armed type, that while most of the plants had spiny fruits, others had fruits with reduced spines. Many of the capsules on three out of the forty plants in this generation were very spiny on part of the surface while totally smooth on the rest. Naudin believed that they united thus by distinct and separate compartments the distinctive traits of the parental types *D. laevis* and *D. Stramonium*. He calls this "*hybridité disjointe*" and cites in this connection the condition in the graft chimera *Cytisus Adami*. In a series of F_2 plants from the same original cross Naudin found 6 individuals out of 38 which again showed more or less well marked his "*hybridité disjointe*" and which were presumably Quercinas.

Godron² reports finding capsules partly spiny and partly smooth. He objects, however, to Naudin's interpretation that the separation of the fruit into smooth and spiny portions is due to their origin from smooth and spiny parents, since he says that he has found this condition when *both* parents had spines.

Bateson and Saunders,³ after discussing the intermediate color of the flowers in the F_1 between white and purple flowered forms, say: "The occurrence of intermediate forms was also occasionally noticeable in the fruits. Among the large number of capsules examined, there were some of the mosaic type, in which part of the capsule was prickly and the remainder smooth, while others suggesting a blend, were more or less prickly all over, but the prickles were much reduced in size, and often formed mere tubercles. These mosaics occurred as rareties both on prickly individuals and on smooth ones still more rarely." Further evidence pointing to the Quercina nature of these abnormal capsules is given in their following statement: "Such intermediate fruits were most often found towards the end of the flowering season."

It may be stated that the writer has grown many thousand plants of the Jimson Weed, including large numbers of individuals that were heterozygous for *inermis* capsules, but has never observed any except Quercinas which showed a mosaic arrangement of the spines on the fruits, with some valves smooth and others more or less spiny. Despite their misconception of the nature of the phenomenon which they observed, it is highly probable that the investigators mentioned were describing the same type of plant that we have considered under the term Quercina.

The Quercina character does not breed true. It is transmitted by seed to about 79 per cent of its offspring when pollinated from normal plants. The remaining 21 per cent normal offspring do not produce Quercina seedlings in the next generation, and hence do not carry the character in a recessive condition.

Two plants which were changing over from a normal to a Quercina condition were investigated with regard to the type of offspring obtained from their individual capsules. There seems to be only a rough correspondence between the strength of the Quercina character in the parent and the number of Quercina plants in its offspring.

As has been stated already, Quercina flowers are characteristically devoid of pollen. In a few plants, however, which were becoming transformed into Quercinas, pollen was obtained and used in crosses onto normal plants. Quercina offspring were obtained from such crosses showing that the character in question can be transmitted through the male.

The non-Mendelian nature of the breeding results with Quercina plants as well as the spontaneous occurrence of the character on branches of normal plants and its spread to the new growth suggested the desirability of attempting to transmit the character by grafting. This attempt was entirely successful and Quercina cions grafted onto normal plants of the Jimson Weed causes the new growth of the stock to take on the appearance of Quercina. There is ample evidence, therefore, to indicate that the cause of the Quercina complex, which by ourselves as well as by earlier investigators had been supposed to be a manifestation of a genetic character, is in fact a disease transmissible by grafting.

It has not been found possible to infect plants artificially by rubbing with diseased leaves nor by inoculation of expressed juice from Quercina plants.

The profound morphological changes brought about in the leaves and especially in the flowers and fruit are such that Quercina individuals would be considered worthy of specific if not of generic separation if 100 per cent of the seedlings instead of only 79 per cent came true to the Quercina complex. As the facts stand, however, there is much in the behavior of Quercina plants which suggests genetic phenomena.

To one who has read the data presented in the foregoing pages, certain similarities may be apparent between the Quercina in the Jimson Weed and rogues in peas investigated by Bateson and Pellew.⁴ It will not be desirable, however, to discuss the two forms more in detail until grafting experiments with the rogues in peas have given definite results.

A detailed account of the Quercina disease with photographs will appear shortly in the *Journal of Genetics*.

¹ Naudin, Ch., *Nouvelles Recherches sur l'Hybridité dans les Végétaux*, *Nouv. Arch. Mus.*, **1**, 1865 (41-54).

² Godron, D. A., *Des hybrides et des metis de Datura.*, Nancy, 1873 (1-75).

³ Bateson, W. and Saunders, E. R., Report to Evolution Committee of the Royal Society, **1**, 1902 (21-32).

⁴ Bateson, W. and Pellew, Caroline, "The Genetics of 'Rogues' among Culinary Peas," *Proc. Royal Soc.*, **91**, 1920 (186-195).